

(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization
International Bureau



(43) International Publication Date
4 October 2001 (04.10.2001)

PCT

(10) International Publication Number
WO 01/72260 A1

(51) International Patent Classification⁷: **A61J 7/04**

(21) International Application Number: PCT/SE01/00658

(22) International Filing Date: 26 March 2001 (26.03.2001)

(25) Filing Language: Swedish

(26) Publication Language: English

(30) Priority Data:
0001049-6 24 March 2000 (24.03.2000) SE

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(81) Designated States (national): AE, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CR, CU, CZ, DE, DK, DM, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, TZ, UA, UG, US, UZ, VN, YU, ZA, ZW.

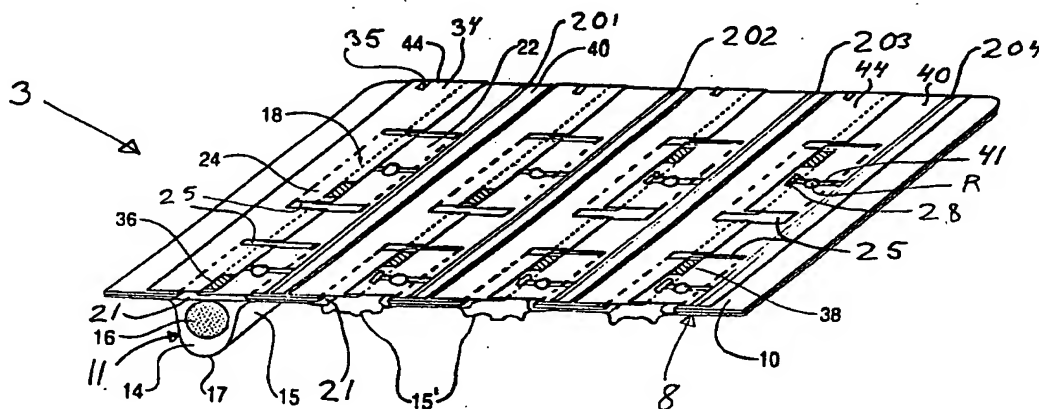
(84) Designated States (regional): ARIPO patent (GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE, TR), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG).

Published:

— with international search report

For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

(54) Title: STORAGE MEANS SPECIALLY INTENDED FOR MEDICAMENTS AND STORAGE PLATE BELONGING THERETO



(57) Abstract: The invention relates to a medicament storage device which includes a storage plate (3) with a plurality of storage spaces (14), arranged in rows, intended to accommodate for instance a medication dosage (16). Electrical contacts (26, 30; 28, 32) at the closure lids (22, 24) of the spaces are connected in parallel through conductor branches and resistances (R) to conductors (101, 102, etc.; 201, 202, etc.) which are connected to a base unit (2) for registering of removal of a medicine dosage (16) from respective space (14). For each conductor (101, 102, etc.; 201, 202, etc.) coming in through its connection (7, 7') the base unit contains means for measuring of current and/or resistance to get information about how many spaces (14) which are in open position.

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STORAGE MEANS SPECIALLY INTENDED FOR MEDICAMENTS AND STORAGE
PLATE BELONGING THERETO

- 5 The present invention relates to a storage device specially intended for storing medicaments, such as pills, capsules tablets or the like of the kind defined in more detail in the preamble of Claim 1.
- 10 Storage devices intended to facilitate the taking of a medicine dosage at the right time are known to the art. One example is dosage packages which are divided into different compartments corresponding to a daily dosage. However, these dosage packages give no satisfactory control over when the
- 15 medicine dosage actually is taken. Also known to the art are medicine storage devices which produces an acoustic alarm signal when it is time to take the next medicine dosage. They include some kind of acknowledgement means for the medicine intake, for instance when the lid is opened. At the same time
- 20 there may occur a registering of when a dose is taken. At these dosage packages there is no possibility of checking how many pills which are taken. They are also restricted to one single kind of medicine, while a dosage package can be loaded with several different medicines in the same compartment.
- 25 US 6 032 085 teaches a storage device intended to make it possible to take several different kinds of medicine from the same unit. It consists of a plurality of disengageable containers for different pills or the like of different size.
- 30 Each container comprises a measuring device for the discharge of the wanted amount of pills as prescribed by the doctor for each medicating occasion. The measuring device is of the rotary vane feeder type and is intended to be exchanged by a chemist to correspond to the wanted number of pills and pill
- 35 size. The times for taking medicine and how many pills or the like which are intended to be taken is entered into a computer and the information is transferred to the memory of the device. According to a preferred embodiment the memory

consists of a removable data-medium similar to a smart card which contains all necessary data functions.

When the device is in use, it produces a signal when it is
5 time to take medicine and simultaneously a light emitting diode is lit at the one of the containers from which the medicine is to be taken. When the discharge is done this is registered in the memory.

10 This device is mechanically complicated and it is obviously only permitted for chemists and other medically trained personnel to refill it. In particular, the handling of measuring devices of different size for the discharge constitutes a problem. Furthermore, an unreliable function
15 can be expected because of wear on the measuring device.

Storage devices which include blister-sealed packs or packages comparable therewith including a memory and an alarm part and/or a registering part which registers when a dose is
20 taken are also known to the art. EP 0 398 996 describes a storage device of this kind which includes a sheet provided with holes which corresponds to the positions of the alveoli in a blister-sealed pack. Each hole has adjacent thereto electrical contact surfaces which are connected so that each
25 alternate surface is connected to a common electrical conductor and each other alternate surface is connected to a specific conductor for each pill or tablet location. When a pill is pressed out, the aluminium foil sheet surrounding the tablet location is broken-up and makes an electric contact
30 between the different contact surfaces such as to cause a signal to pass through the memory unit in acknowledgement of the dosage being taken. EP 0 191 168 teaches a similar device which includes a perforated sheet on which a blister-sealed pack is intended to be placed. Each hole accommodates a
35 sensor which sends a signal to the memory unit when a pill, tablet or the like passes the hole. EP 0 129 785 teaches a blister-sealed pack which includes electrical conductors that extend over those regions of the foil sheet that are intended

to be depressed and broken when removing a pill, tablet or the like.

WO 98/36727 teaches a device intended for four blister-sealed
5 packs. It consists of a sheet-like casing intended to be
folded around the separate blister-sealed packs and an
electronic registering and memory unit with alarm function.
The casing exhibits openings with detachable lids above the
opening positions of the blister-sealed packs. The lids are
10 transversed by electrical conductors. The conductors are
connected to the electronic base unit. When a pill is removed
through its adjacent opening, the lid conductor is broken and
registering occurs. At this device there is a risk that the
aluminium foil connects with the conductors at the hole edges
15 causing a short circuit. Then no registering will occur.

The applicants own earlier patent US 5 836 474 teaches a de-
vice with a storage plate provided with holes. Beneath each
hole there is a storage space for a medicament dosage. Each
20 hole is covered with a long and a short lid flap with elec-
trical contact surfaces which are connected to an electronic
base unit by conductors. There may be contact surfaces and
conductors on both sides of the lids or only on one side.
Alternatively, one of the lid flaps can be electrically
25 conductive in its entirety.

A signal is produced, when a medicine dosage passes through
the lid flaps in either direction. In this way an acknow-
ledgement is given, that a medicine dosage has been taken.
30 The base unit gives a signal, when the medicine shall be
taken and also indicates from which space it shall be taken.
It is possible to fill different kinds of medicine in
different spaces and in this way get the same function as for
a dosage package. In this case, each space exhibits an
35 elastomeric membrane bottom or a movable bottom. The spaces
are filled through the exit opening and at the same time the
lid flaps exchange position into a "pill-in" position. In a
second embodiment conventional blister-sealed packs are
positioned under a holed plate with lid flaps.

When it is charged with a blister-sealed pack, the storage device of US 5 836 474 has the same limitations as the previously described storage devices for blister-sealed
5 packs, and that is that it can only be used for one kind of medicine at a time. In the case of the embodiment with re-fillable storage spaces, it applies, that it can be difficult to handle for patients with limited ability of movements and/or reduced eyesight, when it is filled with different
10 kinds of medicine in different spaces. Here, it is a question of finding the right storage space among a number of small storage spaces which all look the same. Furthermore, an empty storage space will resume its earlier filled form after removal of its content.

15

Previously known storage plates with a registering function have the drawback, that they comprise a great number of conductors to the base unit intended for the reporting of occurring events. This is especially the case for devices
20 comprising blister-sealed packs and similar structures with a great number of storage spaces.

25

Accordingly, the object of the invention is to provide a storage device with a base unit and an associated storage plate, which with a limited amount of conductors can provide a fully satisfactory reporting to the base unit.

30

A further object of the invention is to provide a storage device which can accommodate several different kinds of
30 medicine separate from each other without any risk of mixing up the medicines, and which can be handled even by physically and visually handicapped people as well as demented people. A further object of the invention is to provide a storage device in which more than one blister-sealed pack of the same
35 or different kind can be entered and from which blister-sealed packs medicine can be taken out independent of the other blister-sealed packs. Another object of the invention is to provide a storage device which will give an unfailing sensing of pill passages without any risks of non-occurring

signals or false signals. The object of the invention is also to provide a storage device with a simple and dependable construction and which has only a few movable parts and is inexpensive in manufacture.

5

These objects are achieved by the storage device according to the present invention, the characterizing features of which are set forth in the following Claims.

- 10 The invention will now be described in more detail with the aid of an exemplifying embodiment thereof and with reference to the storage device of US 5 836 474. It will be understood that the invention is not restricted to this previously known storage device but can be applied to any of the storage
15 devices described above intended for use with blister-sealed packs.

The exemplifying embodiment of the invention is described in with reference to the accompanying drawings, in which:

20

Fig. 1 illustrates an inventive storage device which includes two storage plates,

Fig. 2. is an end view of the storage device of Figure 1,

25

Fig. 3 is a perspective sectioned view of a storage plate with refillable storage spaces according to the state of the art,

30 Fig. 4 is a perspective sectioned view of an inventive storage plate comprising a blister-sealed pack,

Fig. 5 is an enlarged sectioned view of a storage space shown in Figure 3,

35

Fig. 6 is an enlarged sectioned view of a storage space shown in Figure 4 and

Fig. 7 is various examples of inventive storage devices intended for blister-sealed packs of different sizes.

Figure 1 illustrates an inventive storage device 1 which includes a base unit 2 having a memory and an alarm signal function, and means for attaching a first storage plate 3. The device includes a removable protective casing or lid 4. The base unit includes a LCD-window or light diode window 5 and also a number of buttons or keys 6 with which a medication program can be keyed-in and with which programs and possible events can be checked. The attachment or fastener means may have the form of a storage plate insertion opening 7 provided with electrical connection contacts (not shown) for co-action with electrical conductors, which provides information if the openings of each of the storage spaces are open or closed. On the storage plate a blister-sealed pack 8 can be arranged (see Figure 4). The storage plate is kept in position with the aid of a frame structure 9.

In the lower part of Figure 1 there is shown a second storage plate 3' connected to the base unit 2 by a second insertion opening 7' provided with electrical connection contacts.

The function of the device is previously known, for instance from any of the afore-mentioned patents. It can vary for different applications in order to adapt to the requirements in question; clinical tests or general watch of medicine intake. The manner to communicate with a possible central computer may also differ. This is outside the scope of the present invention it will therefore not be described here.

The insertion opening 7, 7' exhibits electrical connection contacts for conductors to and from its corresponding storage plate. Electrical signals through the conductors 201, 202 etc. respectively, are processed in the base unit to register events in its memory and to perform actions such as alarm or the like if necessary. Possibly, the base unit may contain means for searching the conductors 201, 202 etc in turns, thus reducing the number of electrical components.

In order to explain the difference in relation to the prior art, Figures 3 and 5 exhibit a first embodiment of a storage plate, which is of the kind disclosed in US 5 836 474. The difference in the number of conductors is evident in comparison with the Figures 4 and 6, which exhibit a second embodiment of a storage plate according to said patent, which plate has been modified according to the present invention. As will be shown in the following, also the storage plate according to Figures 3 and 5 is easily modified in accordance with the present invention.

Figure 3 illustrates a storage plate which includes a base plate 10 and a plate 12, in this Figure shown in a bottom position, said plate having formed therein pits or alveoli 11 which include walls 15 and a bottom 17 each enclosing an individual space 14 which is intended to accommodate a medicament dose 16. The dose may consist in one or more units, such as tablets, pills or capsules of one or different types. The base plate 10 is provided above each alveolar 11 with a hole 18 through which the dose is intended to pass. At least that part of the bottom plate 12 which forms the walls 15 and the bottom 17 of the alveoli is comprised of an elastomeric membrane. The medicament dosage can be pressed-up through the hole 18 in the same manner as in a typical blister-sealed pack, by pressing against the bottom 17 of respective alveoli 11.

Each hole 18 is covered by a lid 20 comprised of a long lid flap 22 and a short lid flap 24 made of a resilient or springy material. The short flap 24 is made either of a non-electrically conductive material and will then have a first electrical contact surface 28 on the underside thereof and a second electrical contact surface 32 on the upper side thereof, or is made of an electrically conductive material, wherein the flap surfaces form the contact surfaces 28, 32. A first contact surface 26 is provided on the upper side of the long flap 22 and a second contact surface 30 is provided on the underside thereof. The two contact surfaces 28 and 32 are

both connected to a conductor 34 incoming from the base unit 2. This conductor is connected to all short flaps 24. An individual conductor 101, 102, etc. extends from each of the long flaps 22, from a respective first contact surface 26 thereon to the base unit 2, and a second individual conductor 201, 202 etc. extends to the base unit 2 from the second contact surface 30 on respective long flaps. This enables the base unit to detect, in a known manner, the position or status of the lid flaps over each of the spaces 301, 302 etc. defined by the alveoli 11. Respective conductors leading from the first and the second contact surfaces on the flaps 22, 24 include electrical contacts 35 located adjacent the edge of the storage plate 3 and intended for connection to the base unit 2. These conductors can be used to activate a light emitting diode or LCD-window 401, 402 etc. to mark the space that is next in line to deliver the next medicament dosage.

Figures 4 and 6 depicts a storage plate arranged for receiving a blister-sealed pack 8. Corresponding parts have been assigned the same reference numerals as in Figures 3 and 6. The parts of the blisters 11 are assigned the same reference numeral as the corresponding alveoli. Figure 4 also shows empty, wrinkled blister rooms which are denoted 15'. In Figure 4 the short flap 24 exhibits a colour or sign marking 36, which depicts an "inward"-position, and the long flap 22 exhibits a colour or sign marking 38 which depicts an "outward"-position. These markings serve as a help when restituting the lid flaps of the base plate 10 before mounting of a new blister-sealed pack 8.

30

The separate rooms of the blister-sealed pack are covered with a foil 21 which is broken when a pill is taken out.

35

The lid flaps 22 and 24 may have the form of separate tongues that are attached to the base plate 10 or may have the form of continuous rows of tongues as illustrated in Figure 4, which illustrates foil strips 40, 44 in which slots 25 have been punched to leave intermediate long and short tongues 22 and 24 respectively.

Figure 4 shows a foil strip 44 with short lid flaps 24 made in a conductive material which constitutes the incoming conductor 34. On the foil strip 40 provided with long lid flaps 22 there are arranged common conductors 201, 202 etc.. Over each long lid flap extends a conductor branch 41, which through a resistance R leads to the electrical contact surface 28. The base unit can now calculate how many openings 18, which are in open position, by simple current or resistance calculation. In the full position the contact surface 28 is in contact and leads electric current and in open position it is laying free on top without any contact.

This design with common conductors 201, 202, etc. can of course also be used at the storage plate of Figures 3 and 5. This has been suggested in Figure 5 by a resistance R symbolically shown in broken lines on top of both the long and the short lid flaps 22, 24. The resistances are shown on the exit side so they will not be damaged when the tablets are pressed out. For refilling it is naturally possible to remove the plate 12, in the Figure shown as a bottom plate, from the base plate 10 and refill it in separated position. Suitably, this is done by first removing the entire base plate 3, 3' from the base unit and the frame structure 9. At the same time can unused pills and portions of blister-sealed packs be removed.

Figure 4 teaches such a design of the base plate, that there are possibilities to provide different kinds of tablets in different rows lengthwise or crosswise. For instance, this can be used in the kind of blister-sealed pack which is described in WO 80/02342. Here is disclosed two blister-sealed packs arranged to be placed one top of the other; the top one exhibiting holes for the blisters of the bottom one and the bottom one exhibiting holes beneath the openings of the top one.

Figure 2 depicts a cross-section along the plane A-A in Figure 1. It shows two frame parts which between themselves

carry two storage plates 3, 3'. Each frame part consists of a middle portion 82 and two flanking portions 84 with slanting sides 86. In the frame parts there are made slots 88, wherein the storage plates 3 are inserted. The frame parts 9 and the storage plates 3, 3' enclose a discharge chamber 89 for the pills which are pressed out through the holes 18. In case that the storage plates with their blister-sealed packs lacks in rigidity, support structures 90 can be arranged between them.

10

Figure 7 discloses various examples how similar and dissimilar blister-sealed packs or parts thereof can be mounted in a device according to the invention. Figure 7 a shows the simplest case, in which an entire blister-sealed pack is arranged in in the storage plate 3. A message about a medicine withdrawal is conveyed through the connection 7 to the base unit 2. In the window 5 you get instructions that the medicine shall be taken from the storage plate visible in the Figure or a storage plate at the opposite side.

20

Figure 7 b discloses a base plate 3 designed to receive two blister-sealed packs 8 A and 8 B for small pills. Messages about medicine taking is made through the connections 7 A and 7 B. Figure 7 c discloses how, in a similar way, pieces of divided blister-sealed packs for big pills are arranged on the storage plate 3 in corresponding way.

The embodiment of the storage plate shown in Figure 4 offers a possibility of a more split up distribution of pills on the plate. Each line of holes 18 connected to the same report conduit 201, 202, etc. can have the same kind of pills which is different to the pills in the other lines of holes. An indication, for instance a light emitting diode 501, 502, etc. in the frame 9, indicates from which row the pill is to be taken. See Figure 7.

Information about the medication can be brought to the base unit of the storage device in an arbitrary way; such as by the buttons 6 of the exemplifying embodiment, an external

key-board or a central computer. Some information can also be stored in a blister-sealed pack with internal circuits and transferred to the device when the blister-sealed pack is inserted. The device may also comprise alternate storage
5 plates containing a different amount of pill positions and/or areas for blister-sealed packs 8 A, 8 B. The number of connections 7 A, 7 B which achieve contact will give information of this.

10 The indication about which of the spaces 14 which are filled or empty must not necessarily take place with the aid of conduits passed by electrical currents, contact surfaces 26, 30,; 28, 32 and resistances R, which means for each incoming lead interact with means for measuring of electrical currents
15 or electrical resistances in the base unit 2. Several alternative measuring methods are possible. According to one solution, there are electrical indicating means 26, 30,; 28, 32 of the capacitive type, in which case the base unit 2 for each conduit 101, 102 etc.; 201, 202 etc. entering through
20 the connections 7, 7' comprise means (not shown) for measuring of capacitivity thus receiving information about how many spaces 14 which are in open position. Such capacitivity sensors and measuring means are known in the art and therefore they are not described in detail.

25

It will be understood that the invention is not restricted to the illustrated and described exemplifying examples thereof and that modifications can be made within the scope of the inventive concept as defined by the following Claims. For
30 instance, the frame 9 may consist of a single U-shaped profile as shown in Figure 5. The invention may also be used for blister-sealed packs with built-in indication means over each opening, for instance as taught by EP 129 785. The storage plate may also be a plate, which is foldable around a
35 multiple of blister-sealed packs. In this case the indication means for each blister-sealed pack position each are connected to its own connection 7A, 7B on the base unit 2.

CLAIMS

1. A medicament storage device which includes a storage plate (3) with a plurality of storage spaces (14) intended to accommodate for instance a medication dosage (16) with electrical indicating means (26, 30; 28, 32) for the registering of the removal of a medicine dosage from respective space, said indicating means through conductors (101, 102, etc.; 201, 202, etc.) to a connection (7, 7') being connected to a base unit (2) with an alarm function and means for registering of the medicine intake, characterized in that said indicating means (26, 30; 28, 32) for at least two spaces each are connected in parallel over a resistance (R); and that the base unit (2) for each through the connection (7, 7') incoming conductor (101, 102, etc.; 201, 202, etc.) comprise means (not shown) for measuring of current and/or resistance thus receiving information of how many spaces (14) which are in open position; or that said electrical indicating means (26, 30; 28, 32) are of the capacitive type, and that the base unit (2) for each through the connection (7, 7') incoming conductor (101, 102, etc.; 201, 202, etc.) comprise means (not shown) for measuring of capacitivity thus receiving information of how many spaces (14) which are in open position.

2. A device according to Claim 1, characterized in that the indicating means (26, 30; 28, 32) for all spaces (14) in a longitudinal or transversal row over the storage plate (3) are connected in parallel over resistances (R) to the same conductor (101, 102, etc.; 201, 202, etc.), or that the indicating means (26, 30; 28, 32) are of the capacitive type and for all spaces (14) in a longitudinal or transversal row over the storage plate (3) are connected in parallel to the same same conductor (101, 102, etc.; 201, 202, etc.)

3. A device according to Claim 1 or 2, characterized in a second storage plate (3') with a separate connection (7') to the base unit (2), and in that the base unit (2) is arranged to give an indication (5; 401, 402...; 501, 502...) about

from which storage plate (3, 3') the medicine shall be taken, when the alarm signal sounds.

4. A device according to one or more of the preceding Claims, **characterized in** that at least one storage plate (3, 3') is reusable and can be filled with new medicine dosages (16) in respective space (14).

5. A device according to one or more of the preceding Claims, **characterized in** that at least one storage plate (3, 3') is designed in such a way that a blister-sealed pack (8) can be mounted therein.

6. A device according to one or more of the preceding Claims, **characterized in** that at least one storage plate (3, 3') is divided in at least two separate fields for blister-sealed packs or parts thereof (8A, 8B) of the same or different kind, and that respective field exhibits a separate connection (7A, 7B) to the base unit (2).

7. A device according to one or more of the preceding Claims, **characterized in** that at least one storage plate (3, 3') is a blister-sealed pack (8) with integrated electrical circuits and that it is connectable to the connection (7, 7') of the base unit (2).

8. A device according to one or more of the preceding Claims, **characterized in** that the storage plate or storage plates (3, 3') is or are removably fitted in a frame structure (9) in order to facilitate refilling, removal of not consumed pills and possibly correction of the removal of the wrong medicine.

9. A device according to Claim 8, **characterized in** that the storage plate or storage plates (3, 3') when detached can be separated into a base plate (10) and a bottom plate (12) alternatively one or more blister-sealed packs (8) or parts thereof.

PARTS LIST

5

1/2

R resistance

1 storage device

10

2 base unit

3 first storage plate

3' storage plate

4 casing or lid

5 LCD-window or light diode window

15

6 buttons or keys , inmatningstangenter

7 storage plate insertion opening , (first)

7' storage plate insertion opening , (second)

7A, 7B connections

8 blister-pack

20

8A, 8B blister-packs 8 A and 8 B for small pills

pieces of divided blister-packs for big pills

9 frame structure, frame, frame parts

10 base plate

10 borttagbar eller uppfällbar basplatta?

25

11 utbuktningar eller alveoler; Blister

12 bottom plate , stel undre platta

14 space, alveoli

15 walls, fasta väggar

30

15' empty, wrinkled blister rooms

16 medicament dose/dosage; tablets, pills or capsules,

17 bottom

18 hole

20 lid

35

21 foil which is broken

22 long lid flap

24 short lid flap

25 slots

2/2

- 5 26 first contact surface
 28 first electrical contact surface
 30 second contact surface
- 10 32 second electrical contact surface
 34 incoming conductor
 35 electrical contacts
 36 color marking and/or a sign marking, on 24
 ("inward"-position)
 38 color marking and/or sign marking, on 22
 ("outward"-position)
- 15 40 foil strips
 41 branch conductor
 44 foil strips
- 20 82 middle portion
 84 two flanking portions
 86 slanting sides
 88 slots
 89 discharge chamber
- 25 90 support structure
- 30 101 individual conductor
 102 individual conductor
 201 second individual conductor
 202 second individual conductor
 301 space
 302 space
 401 light emitting diodes or LCD-windows
 402 light emitting diodes or LCD-windows
- 35 501 light emitting diode
 502 light emitting diode

1/5

FIG. 1

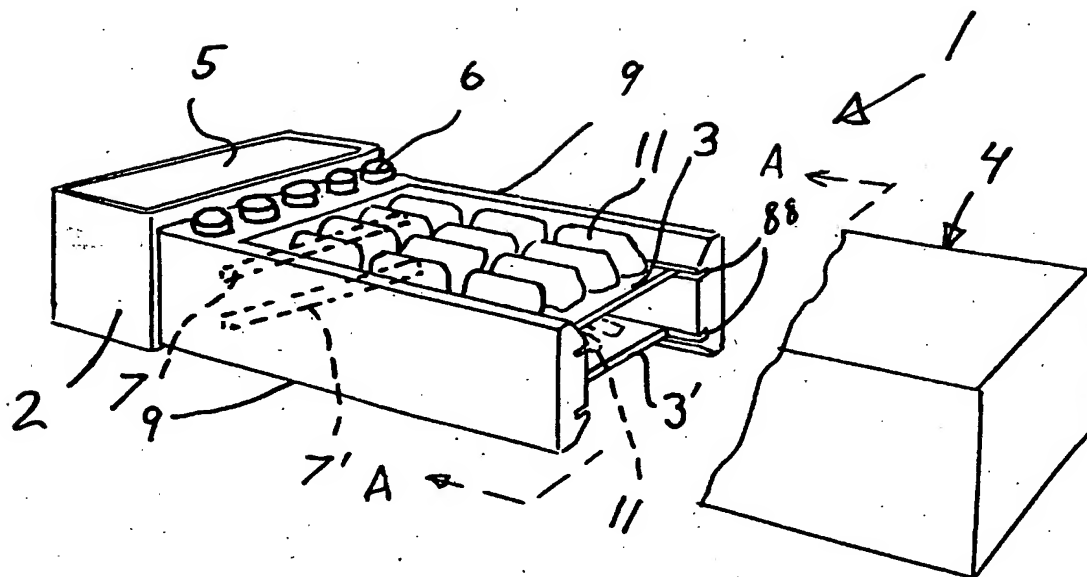
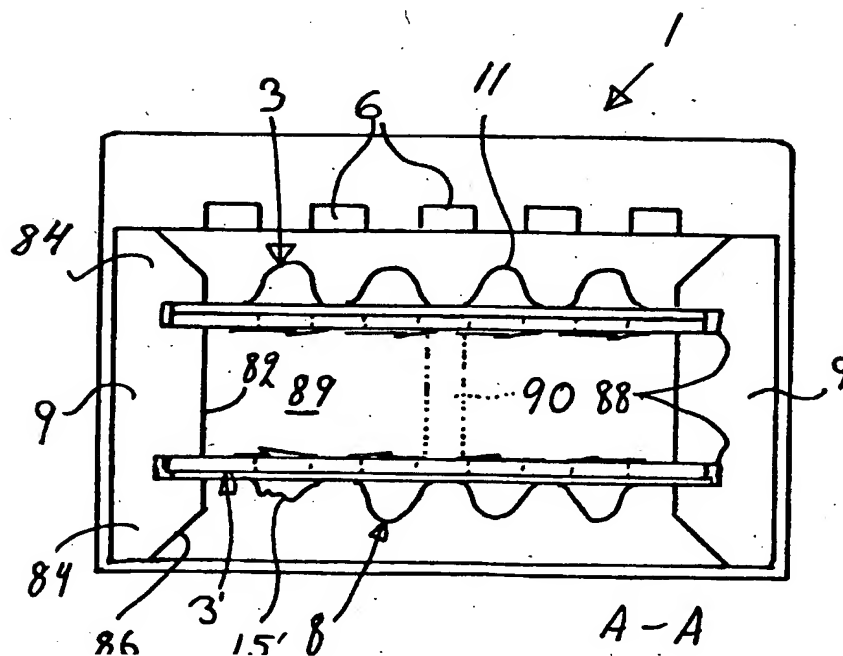
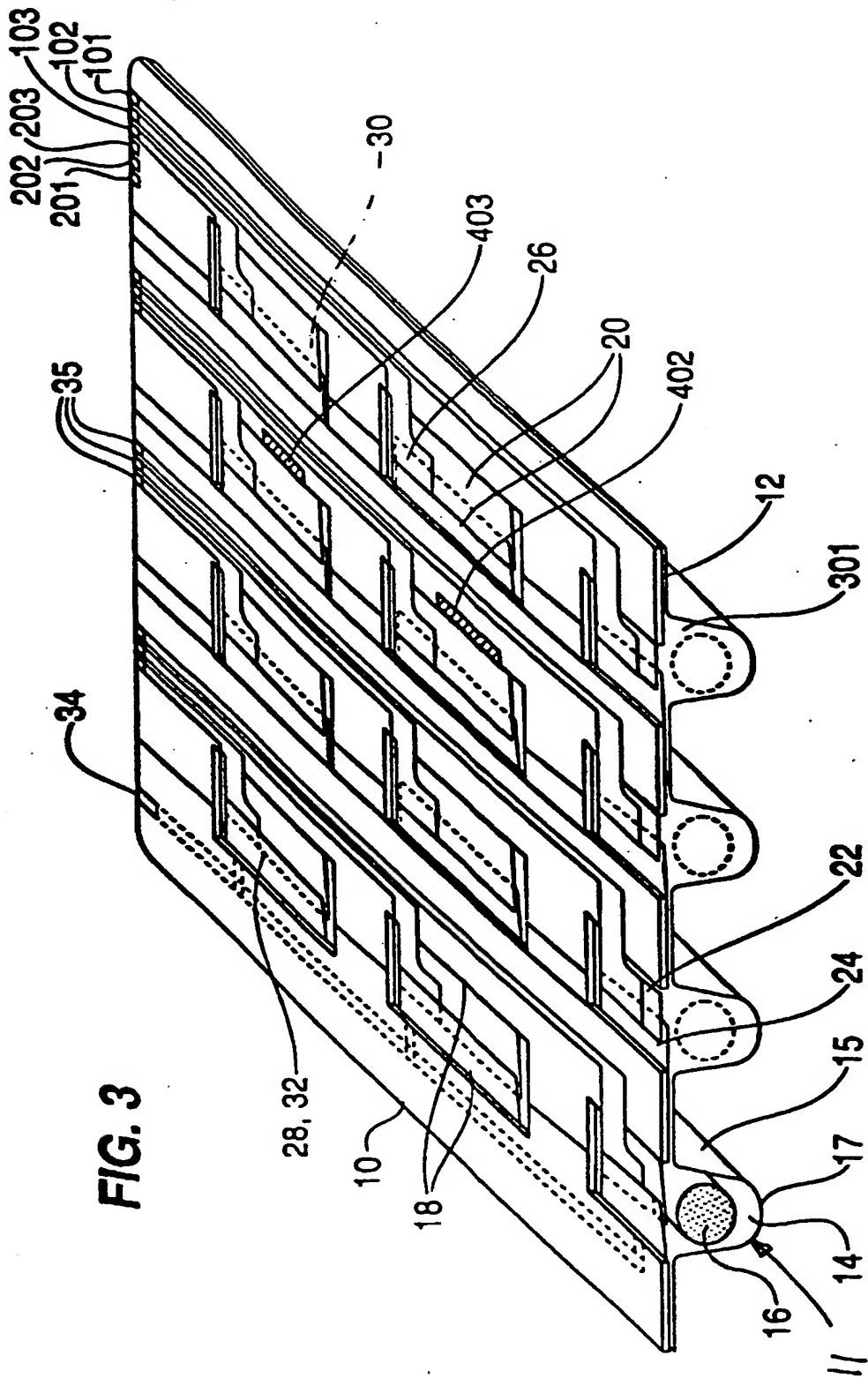
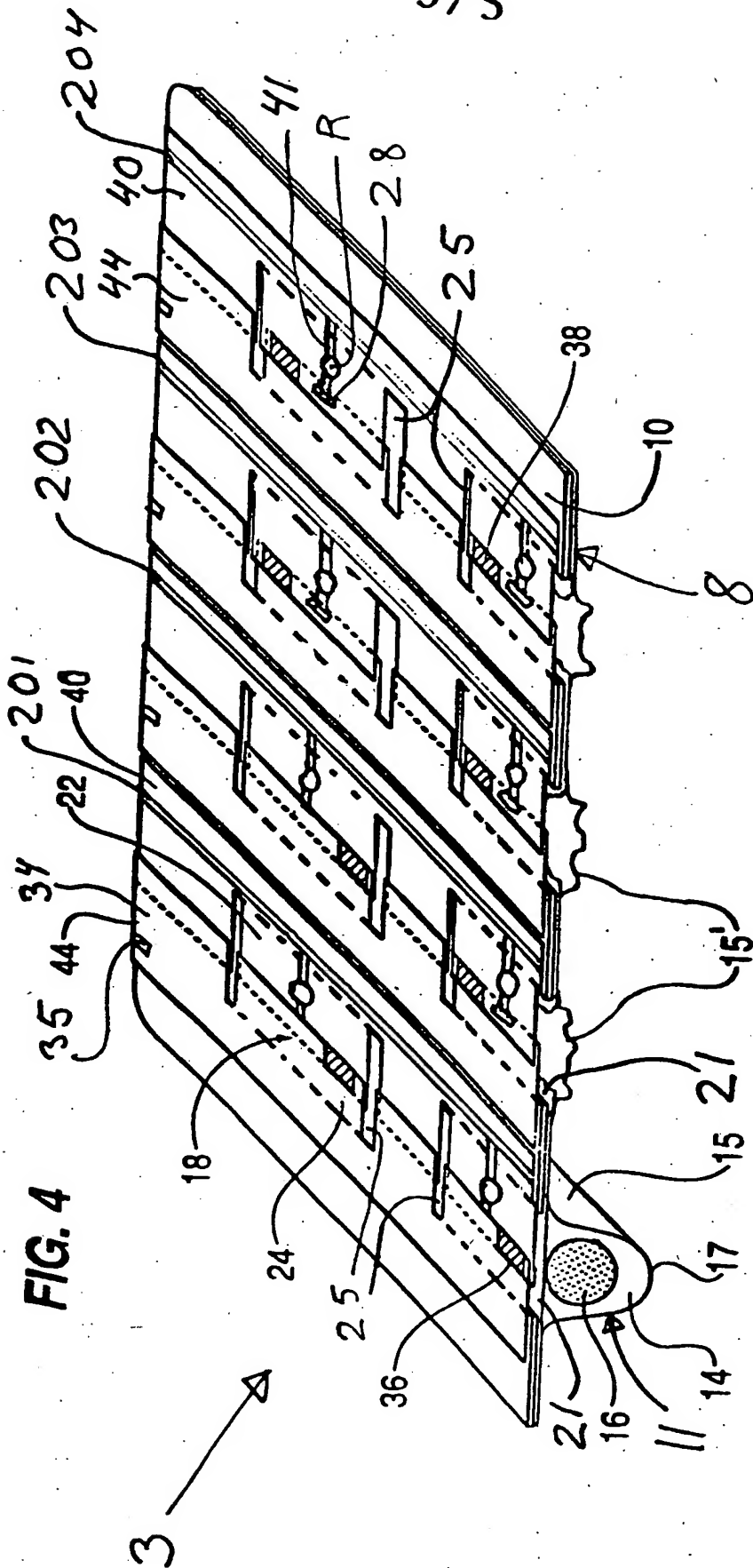


FIG. 2





3/5



4/5

FIG. 6

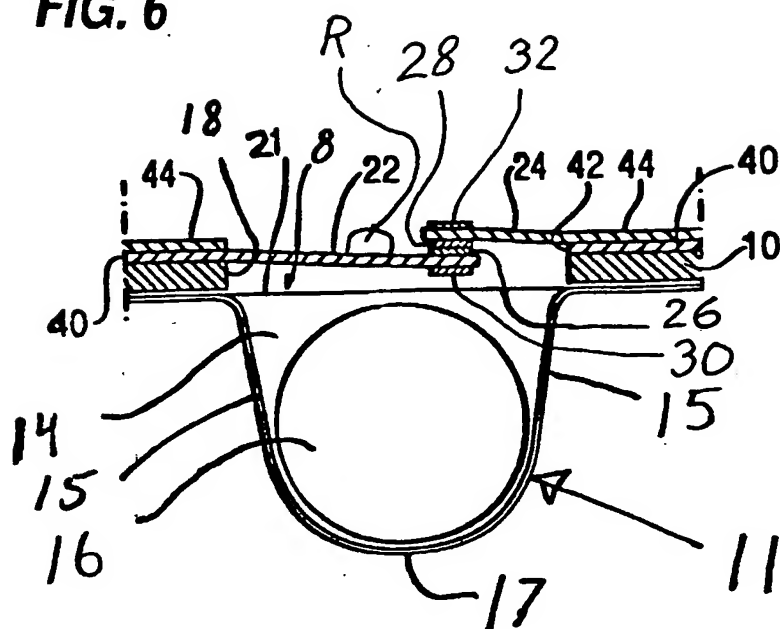
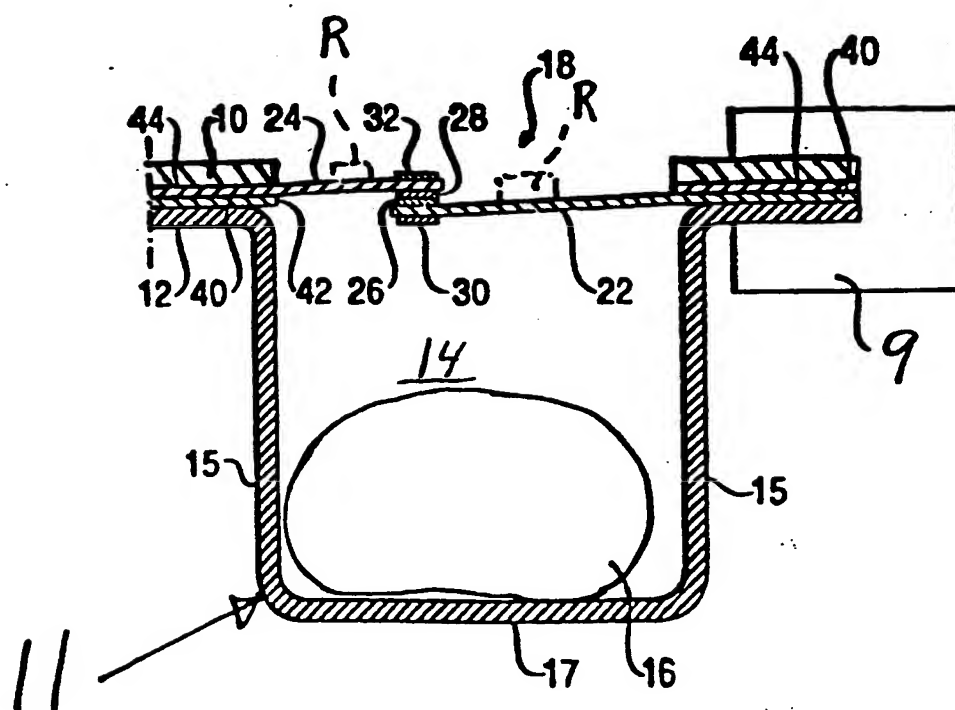


FIG. 5



5/5

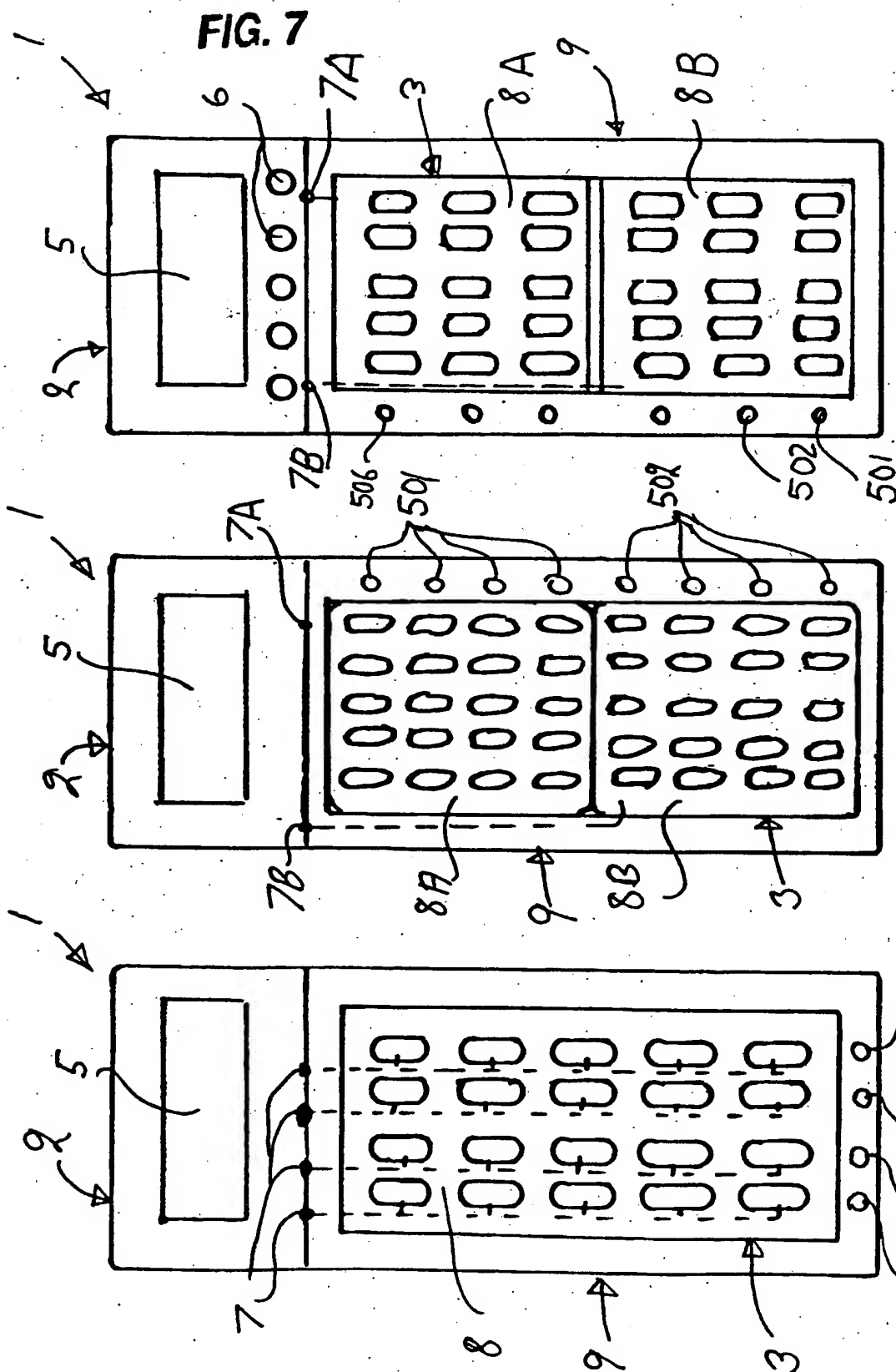


FIG. 7c

FIG. 7b

FIG. 7a

INTERNATIONAL SEARCH REPORT

International application No.

PCT/SE 01/00658

A. CLASSIFICATION OF SUBJECT MATTER

IPC7: A61J 7/04

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC7: A61J

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

SE,DK,FI,NO classes as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

EPODOC, WPI

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 6032085 A (H. LAURENT ET AL.), 29 February 2000 (29.02.00), figures 1-5, claims 1-8 --	1-9
A	SE 512207 C2 (MEDITELLIGENCE AB), 27 May 1995 (27.05.95), figures 1-9, claims 1-10 -- -----	1-9

☐ Further documents are listed in the continuation of Box C.☒ See patent family annex.

* Special categories of cited documents

- "A" document defining the general state of the art which is not considered to be of particular relevance
- "E" earlier application or patent but published on or after the international filing date
- "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
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Date of the actual completion of the international search

16 July 2001

Date of mailing of the international search report

18-07-2001

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INTERNATIONAL SEARCH REPORT
Information on patent family members

02/07/01

International application No.

PCT/SE 01/00658

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